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Contact

Big Facilities for Small Science

Editorial by Tom Brzustowski

In 1994, the NSERC Committee on Materials Research Facilities produced the Bacon Report, which called for national or regional clusters of facilities for materials research. It also called for an immediate national commitment to develop "a fully equipped reactor-based national source for neutron beam research," and "a fully equipped dedicated national source for SR (synchrotron radiation) research." The Committee went on to say that there was "a need for access to both neutron scattering and SR facilities, since these facilities are largely complementary rather than competitive."

A new neutron source would enable Canadian scientists to continue research in a field in which they have a proud tradition of achievement. Indeed, in 1994, Professor Bertram Brockhouse of McMaster University was awarded the Nobel Prize in physics for his pioneering work at Chalk River that developed neutron scattering as a research technique.

The proposals for both the SR source and the neutron source are now being actively discussed. NSERC has been involved with both because many researchers in materials science whose work is supported by NSERC need these facilities. Moreover, the demand for the SR source has grown beyond research in materials science. The synchrotron has become an essential instrument for studying the structure of proteins by X-ray crystallography. The Bacon committee predicted that might happen, but not quite so soon.

The proposal for the synchrotron is the more advanced of the two. A facility called the Canadian Light Source (CLS) has been designed to be built at the University of Saskatchewan. That site was chosen in 1996 in an

(continued on page 2)

4 **Three New NCEs Selected**

8 **S&T on the Breakfast Menu**

11 **Are You Up To the Y2K Challenge?**

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NSERC is the national instrument for making strategic investments in Canada's capability in science and technology. An arm's-length federal agency, it is responsible for promoting and supporting research in the natural sciences and engineering, other than the health sciences.

NSERC supports both basic university research through research grants and project research through partnerships of universities with industry, as well as the advanced training of highly qualified people in both areas.

Editorial from page 1

internationally peer-reviewed competition run by the Canadian Institute for Synchrotron Radiation with help from NSERC. The total cost of the CLS will exceed $150 million. The CLS is a university project, and an application for support has been submitted to the Canada Foundation for Innovation. NSERC will help with the operating costs of the CLS. We cannot do this with the present budget, but we have been making the case for new funds specifically to help researchers with the operating costs of the new infrastructure funded through the CFI. The CFI is expected to decide on the CLS application within the next few months.

The proposal for the neutron facility is quite far along in its technical design, but not as far along in the request for funding. The proposal is to build the Canadian Neutron Facility (CNF) at Chalk River to replace the present NRU research reactor that has been running since 1957. The CNF will consist of a MAPLE research reactor to provide the neutrons, and associated facilities that will make neutron beams available for research. The reactor's main use will be for R&D to support the CANDU business of Atomic Energy of Canada, Ltd. (AECL). The production of neutron beams for research is a complementary use that has been incorporated into the MAPLE reactor design. The cost is estimated at $298 million for the reactor and CANDU R&D facilities, and $90 million for the beam facilities that make the neutrons from the reactor available for scattering research.

The National Research Council and AECL are leading the steering committee for the CNF that also includes McMaster University and NSERC. There is urgency in seeking a funding commitment for the CNF since it would take about six years to build, and the NRU reactor is expected to be shut down in 2005. And, of course, there can be no new neutron source for scattering research unless the new reactor is built.

Both the CLS and CNF are big and expensive facilities, but they should not be thought of as "big science." They are big facilities that support a lot of "small science." Their operation is routine. The potential for discovery is all in the experiments to which they provide the X-rays and neutrons, respectively. Another way of thinking about that is that both the CLS and the CNF can be built with proven technology. There is very little risk that they will not work as designed. The scientific risk is all in the individual experiments attached to the X-ray beam lines and the neutron beam tubes. This is very different from the Sudbury Neutrino Observatory (SNO), for example, all of which is designed for one experiment, and in which the scientific risk extends to the whole facility. SNO is a splendid Canadian example of big science.

The investments in the CLS and CNF are big investments, but they are investments for the long term. Both will provide an important leading-edge research capability for many years. It is a coincidence that both are being considered at the same time, but in fiscal terms it is also a complication. There is a further complication of that kind, in that the financing of TRIUMF must also be renewed at just about the same time. TRIUMF is much more of a big science facility, but even there particle beams are being made available for small science experiments, e.g.: materials research with muon spin resonance.

I hope that our country can find a way to invest in the new facilities that will enable Canadian scientists to carry out competitive research in materials science. The compelling reason for doing that was stated with unmistakable clarity by Dr. D. Allan Bromley, Dean of Engineering at Yale University, former Science Adviser in the White House, and himself a distinguished Canadian physicist with a splendid record of research achievement, including major contributions at Chalk River.

In a conference on the CNF proposal in Ottawa on November 3, Professor Bromley said "When Canadian scientists are given access to leading-edge facilities, they become world leaders." Canada can't afford not to give them that access.

Council Membership News

Newly appointed members shown at their first (Council's 70th) meeting: seated, from left to right, Xiaoyi Bao, Dana Schlomiuk, and Nancy Sherwood; standing, from left to right, Nityanand Varma, Simon Jones, (NSERC President Tom Brzustowski), and Roger T. Pederson.

There were six new faces around the table when Council met in Calgary on October 19 and 20. The appointments of Xiaoyi Bao, Simon Jones, Roger T. Pederson, Dana Schlomiuk, Nancy Sherwood and Nityanand Varma had been announced only two weeks earlier by John Manley, Minister of Industry, and Ron Duhamel, Secretary of State (Science, Research & Development).

Dr. Xiaoyi Bao is an associate professor in the Department of Physics at the University of New Brunswick. She carries out research in fibre optics, including the use of distributed fibre sensors to sense temperature and strain over long distances. Dr. Bao has held research positions in the United Kingdom, Germany and the United States.

Dr. Simon Jones is a research scientist with Aqua Health Ltd. in Charlottetown, PEI, where he carries out research on fish diseases. He is also an adjunct professor at the University of Prince Edward Island's Atlantic Veterinary College. In 1992, he held an NSERC Industrial Research Fellowship with Aqua Health Ltd.

Dr. Roger T. Pederson is responsible for the strategic development of the research and intellectual property programs of Alberta-based TRLabs, one of Canada's most successful telecommunications research consortia. A long-time engineer and senior manager at Telus Communications (formerly Alberta Government Telephones), he played a significant role in establishing CANARIE, developer of the country's high-speed research network.

Dr. Dana Schlomiuk is a professor in the Department of Mathematics and Statistics at the Université de Montréal. She works in the area of dynamical systems, carrying out research on analytical vector field theory and has lectured extensively in North America and Europe.

Dr. Nancy M. Sherwood is a professor in the University of Victoria's Department of Biology. Dr. Sherwood was elected Fellow of the Royal Society of Canada in 1990 for her research on the evolution of brain hormones.

Mr. Nityanand Varma, P. Eng, holds an M.A.Sc. (Civil Engineering) and an M.A.Sc. (Management Sciences) from the University of Waterloo. He has more than 35 years of experience in engineering, construction, consulting, university teaching, research and management – which includes 23 years with BNR, BCI and Bell Canada. At the time of his retirement from Bell Canada, he was Director (Corporate Planning and Analysis). Mr. Varma is now Chairman and CEO of Industrial Resources.

Also present for the meeting were Gilbert Drouin, John Grace and Thomas Hutchinson, whose terms had been extended for a further three years.

Annual Report Online

The NSERC Annual Report, 1997-98, is now available online. To read it, visit our Web site, at ***www.nserc.ca/publicat.htm.***

Three New NCEs Selected

Ron J. Duhamel, Secretary of State (Science, Research and Development), announced October 15 that the federal government will invest $41 million over the next four years in three new Networks of Centres of Excellence (NCEs): the Canadian Arthritis Network (CAN), the Geomatics for Informed Decisions Network (GEOID), and the Mathematics of Information Technology and Complex Systems Network (MITACS).

The new NCEs will join 11 existing federally funded networks that conduct cutting-edge research in sectors of critical importance to Canadians, such as health and biotechnology, information technology, human resources, and natural resources. Over the next four years, the federal government will invest $182.2 million in the 14 networks.

mitacs

The Canadian Arthritis Network will use a holistic multidisciplinary approach to ensure that research breakthroughs move quickly from the laboratory to the marketplace, providing Canadians with easy access to the latest discoveries and treatments. Network research priorities will respond to the needs of the four million arthritis patients who must cope every day with this disabling condition.

The GEOID Network will build on Canada's strength as a world leader in geomatics, and will open new business opportunities for Canadians. GEOID will link Canadian companies and highly qualified university research teams to apply new technologies in a wide range of fields and train the next generation of scientists and engineers. Research areas include mapping and managing our natural resources, tracking key health indicators, detecting environmental disasters and using remote sensing for search and rescue operations.

MITACS will harness Canada's mathematical power for the 21st century. Because of its remarkable ability to model physical, biological and economical systems in ways that permit effective prediction, design and control, mathematics will play a key role in developing the knowledge economy. Advanced mathematical theory will be used in emerging areas: from designing new drug therapies to telephone networks; from analyzing environmental factors that affect our health to understanding complex materials fundamental in modern industry.

The three federal granting councils – NSERC, the Medical Research Council, and the Social Sciences and Humanities Research Council – oversee and support the NCE initiative jointly with Industry Canada.

For more information, visit the NCE Web site at ***www.nce.gc.ca.***

Results of the 1998 Strategic Project Grants Competition

Seventy-three Strategic Project Grants totalling $8 million in the first year have been awarded, following a tough competition.

Selection panels identified another 25 projects they would have supported had sufficient funds been available. They had received 246 proposals.

The overall success and funding rates increased; however, it should be noted that the funding rate (31 per cent) is artificially high because the amounts awarded for the 73 successful proposals were adjusted to include the graduate student and postdoctoral stipend increases approved by Council in June. The amount of the average award also continues to increase, growing from a first annual instalment of $89.7 thousand in 1996, to $92.1 thousand in 1997, and $109 thousand in the current competition.

While projects may be in any area of the natural sciences and engineering, most of those approved for funding fall within the six areas targeted for acceleration by Council in 1995. The selection panels evaluate the proposals on four criteria: merit of the research proposal; interactions and partnerships (see below); training; and management and budget.

Table 1 summarizes the results of the competition by area.

Interactions and Partnerships

Active participation of a non-university partner in each research project is a requirement of the program. Although a cash contribution from the partner is not a prerequisite, often the partner does make a direct financial commitment.

Information on the number and type of partners in the 1998 competition and the level of in-kind and direct contributions over the life of the projects is summarized below.

Type of Organization	Number	In-Kind Contribution (millions of $)	Cash Contribution (millions of $)
Industry	141	6.3	2.0
Government	56	6.0	0.5
Other (e.g. NGOs)	17	0.8	0.1
Total	214	13.1	2.6

Total Contributions from Partners	**$15.7 million**
Total NSERC Investment	**$25.2 million**
Leverage from Partners	**62.3%**

(continued on page 6)

Table 1. Strategic Project Grants Competition Summary

Area	Number of Appl.	Number of Awards	Success Rate (%)	Total in Year I (millions of $) Requested	Awarded	Funding Rate (%)
General Areas	12	1	8	1.2	0.1	8
Targeted Areas						
Biotechnology	65	23	35	7.0	2.1	30
Energy Efficiency Tech.	24	7	29	1.9	0.6	32
Environmental Tech.	64	17	27	6.6	2.1	32
Information Tech.	22	9	41	2.8	1.3	46
Mfg. and Processing Tech.	14	5	36	1.6	0.7	44
Materials Tech.	45	11	24	4.3	1.1	26
TOTAL	**246**	**73**	**30**	**25.4**	**8.0**	**31**

Results of the 1998 Strategic Project Grants Competition from page 5

In the three competitions since the restructuring of the Strategic Projects program in 1995, the non-university partners have consistently contributed more than 50 per cent toward the cost of the research. In line with previous years, the majority of the industrial partners were from small companies (62 of 141) with 50 or fewer employees in Canada or large companies (58 of 141) with more than 200 employees in Canada. Fewer medium-sized organizations participate. This has been typical of the partners involved in strategic projects in recent years.

	1996	1997	1998
No. of partners	244	266	214
NSERC Investment	$30.5 M	$23.9 M	$25.2 M
Investment from partners	$3.9 M	$3.7 M	$2.6 M
In-kind from partners	$12.0 M	$14.6 M	$13.1 M
Total from partners	$15.9 M	$18.3 M	$15.7 M
Leverage	52.3%	78.1%	62.3%

Note: All amounts are over the life of the project.

Competition Highlights

The following are some of the proposals funded in the 1998 competition:

Assessing the Effects of Clearcutting

Over the next three years, Professor Robert Bradley of the Department of Biology at the Université de Sherbrooke will receive $279,146 to lead a project that will focus on the availability of nitrogen – an essential nutrient for tree growth – in the forest floor after clearcutting. Dr. Bradley and his co-applicants, Melanie Jones from Okanagan University College, and Anthony Glass and Cindy Prescott from the University of British Columbia, will use sophisticated analytical techniques to determine how the availabili y of different chemical forms of this nutrient affect the competition between regenerating conifer seedlings and neighbouring plants. An important biological factor included in these studies will be the role of fungi intimately associated with plant roots in stimulating nitrogen uptake.

Western Forest Products Inc., MacMillan Bloedel Ltd., Weyerhaeuser Canada Ltd., Riverside Forest Products Ltd., Interfor Ltd., B.C. Ministry of Forests, and Natural Resources Canada (Canadian Forest Service) will share in, contribute to, and benefit from the results generated in the course of the three-year project. Much of the work will be carried out by undergraduate and graduate students under the supervision of the applicants.

Canada's forestry industry contributes over $30 billion annually to the national economy and creates thousands of jobs. Accurate and objective information that can guide policy decisions on the sustainable management of Canada's forests is of the utmost importance.

Virtual and Augmented Environments for Surgery, Remote Manipulation, Design and Training

Dr. Christine MacKenzie, an expert in hand function from the School of Kinesiology at Simon Fraser University (SFU), is working on a project aimed at developing efficient, intelligent tools that enable humans to easily perform tasks and activities in real and virtual environments. She and collaborators Kellogg S. Booth from the Computer Science Department of the University of British Columbia, John Dill and Shahram Payandeh from the Engineering Science Department of Simon Fraser University, and Kori Inkpen of Computing Science at SFU will receive $715,070 over a five-year period.

The team will design and implement an enhanced Virtual Hand Laboratory with integrated graphic, audio and haptic displays and controls. By focusing on specific types of human performance they will learn about the processes underlying manipulation and remote manipulation. The researchers will also examine interaction between computers and people.

Partners include Northern Digital Inc., International Telepresence (Canada) Inc., DSI Datotech Inc., International Submarine Engineering Ltd., Credo Interactive Inc., Mainframe Entertainment, Inc., Infusion Systems, Radical Entertainment and Sun Microsystems.

Interfaces in organic electroluminescent materials and devices

There is a huge worldwide demand for efficient, inexpensive and reliable display devices, particularly in the flat panel format for computer screens. The present liquid crystal display devices are backlit, expensive, hard to view from many angles and consume too much power, but devices

made from multiple layers of inorganic or organic electroluminescent (EL) materials that emit light during the passage of an electric current hold a good deal of promise.

Over the next three years, Dr. Peter R. Norton, of the Department of Chemistry at the University of Western Ontario, will receive $379,750 to lead a research team that will conduct studies aimed particularly at understanding the role of the boundaries (interfaces) between the multiple layers in the devices and the influence of factors such as the structure, composition, morphology and electronic properties of the materials. This is a very important area of new technology that is expected to have significant economic impact.

The Xerox Research Centre of Canada in Mississauga, Ontario, will contribute $20,000 cash and $150,000 in-kind to the project.

Ultrafast laser processing for manufacturing

Canadian manufacturing industries are steadily adopting laser tools for cutting and processing a large variety of materials.

Dr. Peter R. Herman, of the Department of Electrical and Computer Engineering at the University of Toronto, and his collaborators Robin Marjoribanks (Department of Physics), Dwayne Miller (Departments of Physics and Chemistry), and Marc Nantel (Department of Physics, and Photonics Research Ontario) will receive $483,699 over 4 years to integrate an industrially relevant ultrafast laser system into the Laser Micromachining Research facility through partnership with Photonics Research Ontario. This will create a unique capability within Canada for developing manufacturing processes. The thrust of the project is in two areas: photonics manufacturing for the telecommunication industry, and aluminum sensor technology for manufacturing and materials handling.

The industrial partners – fast-growing JDS Fitel Inc. and base-metal producer Alcan International Ltd. – both based in Ontario, will contribute $20,000 cash and $30,000 in-kind to the project. Photonics Research Ontario will provide an extra $292,000 in-kind contribution over four years.

THE WALL STREET JOURNAL

"I don't know what 'Natural' means either, but business has been great!"

During his recent tour, Dr. Brzustowski found that people like to call us the **National** Sciences and Engineering Research Council. Should we consider swapping names with the First Natural Bank?

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Agreement Promotes Exchanges With Taiwan

NSERC President Tom Brzustowski and Dr. Chin-yen Fang, Taiwan's Representative in Canada, finalized an agreement Nov. 12 (while Dr. Joseph Hsu of TECO looks on) that will make it easier for the two countries to exchange scientific information and for Taiwanese and Canadian scientists to work together.

The Ottawa signing ceremony followed the Sept. 11 signing of the Memorandum of Understanding in Taiwan by representatives of the Canadian Trade Office in Taiwan and the Taipei Economic and Cultural Office in Canada (TECO). Since NSERC and the National Science Council (NSC) of Taiwan will enforce the agreement, Dr. Brzustowski (who was in Taiwan at the time) and a representative of the NSC signed it as witnesses.

Several Canadian and Taiwanese universities have already expressed an interest in participating in scientific exchanges, and are preparing proposals for joint projects.

S&T on the Breakfast Menu

MPs Get the Bacon

The fifth in the NSERC/PAGSE series of "Bacon and Eggheads" breakfasts took place on Parliament Hill on December 3. Dr. Pierre Bélanger, Vice-Principal of Research at McGill University, described how a nationwide research initiative led by PRECARN and the Institute for Robotics and Intelligent Systems is making Canada a leader in the development of systems that can perceive their own environments, reason, and extend human capabilities for specialized tasks. MPs met some of the award-winning products of this private-sector – university collaboration (including a robot that performs knee surgery and an intelligent system that can feel and touch!).

Since the previous report on the NSERC Bacon and Eggheads initiative, in the summer issue of *Contact* (Vol. 23, No. 2), there have been three other breakfasts. In November, the spotlight was on geomatics – and on the University of Calgary's Elizabeth Cannon, one of Canada's most prominent GPS researchers and holder of the NSERC/Petro-Canada Chair in Women in Science and Engineering (Prairie Region). In a fast-paced, 25-minute presentation, Dr. Cannon described key recent developments in GPS and the explosion of applications for it. By combining signals from numerous satellites in the grid, research engineers have made "centimetre"-accuracy a reality for civilian use. Now, they are eagerly turning their attention to augmenting GPS so that it will work reliably in such locations as forests, valleys and cities, where receivers may be out of sight of one or more of the satellites in the GPS grid. Dr. Cannon described the work that she and her colleagues are pursuing, which includes measuring wind deflection in tall buildings and on aircraft wings in flight, and the ultra-precise measurement of water depth in navigable waterways. Applications of GPS to golf and farming attracted the most questions from MPs.

Dr. Elizabeth Cannon and Ron Duhamel, Secretary of State (Science, Research and Development), at the November "Bacon and Eggheads" breakfast.

Reporter Tom Spears of the Ottawa Citizen was in the audience for the presentation (all the breakfasts are open to members of the media and parliamentary press gallery, as well as interested government officials). His feature on Dr. Cannon appeared on the front page of the Sunday, November 8 edition.

In October, Paul Corkum of the National Research Council explained the working of lasers and the history of their development in Canada. Right from the late 1950s, when NRC physicists were major contenders in the race to produce the first laser, Canadian government and university teams have been world leaders in laser technology. Dr. Corkum presented a fascinating account of how a laser works by using a photo that he took of himself and a candle in his bathroom mirror. While laser technology has become so pervasive that we almost take it for granted, Dr. Corkum hinted that the best may be yet to come. He talked about the excitement of his group's work on the femtosecond laser (a femtosecond pulse, he explained, is to one minute, what one minute is to the age of the Universe) and the

"Laser" is an acronym for Light Amplification by Stimulated Emission of Radiation. Just as two facing mirrors trap a portion of the candle's light in this photo, a laser's facing mirrors trap light from a laser medium. The laser operates when the trapped light is amplified by stimulated emission.

possibility in the not too distant future of almost unlimited information carrying capacity on optical fibres, and even optical computers.

Just before the summer break, MPs were treated to an account of how kimberlite pipes and diamonds were discovered in Canada, and the key role that geological research played in the century-long quest to find them. Developments in methods to indicate the presence of minerals and advanced geophysical survey methods are just two of the factors that have resulted in the tremendous exploration successes of the past decade. The slide presentation by Dr. Harvey Thorleifson of the Geological Survey of Canada took place just several weeks ahead of the opening of Canada's first commercial diamond mine.

NSERC and PAGSE (the Partnership Group for Science and Engineering) plan to hold one session per month while the House of Commons is in session. We're always looking for suggestions for interesting new topics and the names of dynamic speakers who can bring them alive. The very best topics, of course, are those that connect research to everyday life and experience; the best speakers are those who are comfortable with an audience that sees science as interesting, relevant and important, yet needs it explained in everyday language.

For researchers who may not yet be ready to take on a presentation on the Hill, but who might be interested in gaining some public speaking experience by talking to a local Kiwanis or girl guide group, we offer some good "how to" material on the NSERC Web site, at ***www.nserc.ca/publicat.htm***. Look under "Communicating Science."

Summaries of all the Bacon and Eggheads presentations mentioned above are available on request from NSERC Communications: write to Arnet Sheppard, Media Relations Officer, Communications Division, NSERC, 350 Albert St., Ottawa, Ontario K1A 1H5; or send him a fax, (613) 943-0742.

Farewell to Leo!

A true pillar of NSERC retired Oct. 23. During an NSERC career that spanned twenty years, Leo Derikx served both as Director (Planning and Budgeting) and Director General of Research Partnerships (formerly Targeted Research). More recently, he applied his enormous energy to the successful drive to promote and launch the Canada Foundation for Innovation, and to stimulating new directions for NSERC.

"Long before I came to NSERC, I knew about Leo as a major figure in the world of research. I credit him with some of the most important advances – especially in the university-industry partnerships area – that this organization has seen," says Tom Brzustowski. "He was the guiding force in building the whole partnership area at NSERC," adds Janet Walden, who took over as Director General of Research Partnerships in December 1997 when Leo left the position to become Special Advisor to the President. "Under his leadership, countless researchers and industrial partners were stimulated to form productive partnerships. There are scores of initiatives today that owe their existence to his efforts."

A professional civil engineer by training (Technological University of Delft, the Netherlands), Leo came to Canada in 1968. After several months with the Department of Energy, Mines and Resources, he took up a position as a research hydrologist for Environment Canada. He also worked for the Science Council of Canada and the National Research Council's Office of Grants and Scholarships before joining NSERC when the Council was established in 1978.

During a reception held in his honour on November 9, Leo told his friends and colleagues that "the word 'retirement' doesn't really capture what I have in mind or how I feel about it: I am looking at it more as a 'lifestyle/career change'... I find it exhilarating to have in front of me an entirely open and uncertain future without any pre-set agenda." He does have a plan for some of his new spare time though, photography – a hobby that he's put aside for the last 30 years. As always, he's planned ahead and has a new "digital darkroom."

All the very very best, Leo.

NSERC Anniversary Draws Attention to Research

During the past twelve months, we've been using our twentieth anniversary to try to interest the press and the public in the work we support.

The centrepiece of the campaign was a tour of Canada by President Brzustowski. There were also ads, a new publication, and additions to our Web site.

The president's tour took him to nine cities where he spoke to business groups about the importance of NSERC to Canada's economy. In the spring, he went to Montréal, Edmonton, Calgary, Vancouver and Toronto. The autumn stops were at Peterborough, Winnipeg, Brandon, and Québec City.

Following Dr. Brzustowski's presentation at the University of Manitoba in October, Joanne C. Keselman, Vice-President (Research) of the University, presents a certificate to him recognizing the Council "on the occasion of its 20th anniversary for its strategic investment in Canada's capability in science and technology."

"We found that business clubs were more interested in having him as a speaker when we told them that this was NSERC's twentieth anniversary," said NSERC communications officer Robert Roy. "They were particularly interested in hearing how their city and region has benefited from university-based research supported by NSERC."

Dr. Brzustowski is joined by Mr. Jean-Pierre Pagé (left), VIA Rail Canada representative, and Mr. Sam Hamad, Treasurer of the Board of Trade and Industry of Metropolitan Québec, following his address to the Board of Trade in September.

The media covered most of the president's speaking engagements, always positively and sometimes in considerable detail. There were excellent stories in important newspapers like the Toronto Star, the Edmonton Journal and Québec's Le Soleil, and electronic coverage as well. The speech to the Canadian Club of Toronto was televised live and repeatedly rebroadcast in the days following the speech.

"I met many business people across the country who already knew about NSERC, but also many more who had never heard our messages before. They responded well, and I think we made many new friends," said Dr. Brzustowski.

The speaking tour was supported by a series of ads featuring the work of four NSERC-supported scientists. We also added new sections to our Web site and published a new leaflet, *Bringing Discovery and Innovation to Life*, that highlights NSERC-supported projects of the kind that affect people's daily lives.

"One of the ways we used the twentieth anniversary was in persuading the officials at Rideau Hall to let us hold the 1998 NSERC awards ceremonies there. The location produced a good response in the media and I think the vice-regal surroundings gave the recipients a really good feeling," said Communications Director Tim Nau.

NSERC in the Headlines

The trend towards more and better press coverage of NSERC continues. In the period from May 1 to September 30 there were 291 stories about NSERC in Canadian newspapers, compared to 196 in the same period last year.

"I think celebrating our 20th anniversary has increased media interest in the research NSERC supports. At least some of this interest is due to the president's ten-city anniversary tour of chambers of commerce, which has been well covered. Also, our award winners this year had good stories to tell. The material on Steacie winner Sara Iverson's work on seal milk, for instance, kept turning up all summer in papers from Nova Scotia to British Columbia," said NSERC Communications Director Tim Nau.

About 12 million copies of the newpapers and magazines containing NSERC-related stories were circulated during the period in question. The cost of buying advertising space equal to this would have been about $240,000.

Press interest in NSERC and NSERC-supported research has been climbing since last fall. Between November 1997 and May 1998 it was 37 per cent better than in the previous year.

You Too Can Make a Difference

Now that the public is becoming more and more interested in science and engineering research and how it affects them, it's up to the research community to help promote their profession. It's easy to become involved – just invite some high school students into your lab, or send an e-mail to Penny Park, a producer at The Discovery Channel, with an interesting science story (parkp@discovery.ca). Give it a try! The rewards can be personal as well as professional.

If you don't know where to start, visit our Web site (***www.nserc.ca/publicat.htm***) and read "Communicating science to the public: a researcher's handbook." It contains examples of successful outreach activities and tips on giving effective media interviews, and provides sources of further guidance and networking contacts.

And if you are successful in promoting your research, don't forget to mention NSERC!

Are You Up To the Y2K Challenge?

The Year 2000 (Y2K) problem or bug poses an unprecedented challenge to our technology dependent society. It is global in its dimensions and affects governments, businesses, educational institutions and individuals alike. Within the federal government, the issue poses a serious challenge not only to internal computer systems operations but also within the context of the delivery of programs and the interdependence with communication and information systems operated by other sectors of society, including universities. Meeting this challenge is a high if not crucial priority.

NSERC, the Social Sciences and Humanities Research Council and the Medical Research Council are reviewing their systems and databases for Y2K compliance. This requirement has already been built into the Canada Foundation for Innovation's systems. Externally, institutions and individuals in receipt of the various forms of awards from the Councils have a responsibility for the scientific, administrative and financial aspects of the activities being sponsored through those awards, including the Y2K problem.

Universities and award holders may be operating commercial and/or in-house computer systems and databases that will experience operational difficulties because they are unable to handle the transition from the year 1999 to the year 2000. Others may fail because they do not properly consider 2000 a leap year. At the laboratory level, embedded microchips in electronic devices and equipment that perform date-based calculations may be affected. If a chip receives what it perceives to be an invalid date, it may fail, impacting on the validity of test results. These are just examples of the many difficulties that may be encountered.

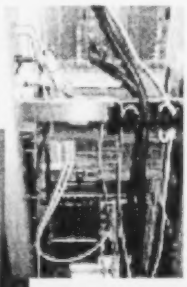
Universities and affiliated institutions should take appropriate actions to ensure that administrative, financial and scientific activities related to the three Councils and their awards are not put in jeopardy or adversely affected by the Y2K bug.

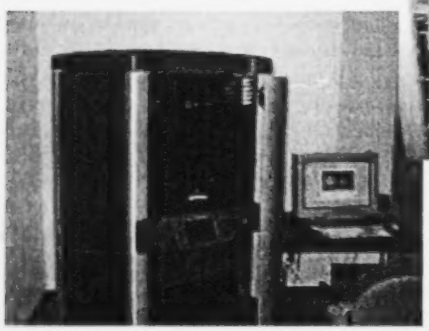
Information on Year 2000 activities, plans and issues can be found on Industry Canada's Y2K site: ***www.strategis.ic.gc.ca/year2000*** (English) or ***www.strategis.ic.gc.ca/an2000*** (French).

Research Profile

Computer Science's New CAVE

University of Alberta scientist Mark Green wants researchers to be able to explore a different kind of "CAVE™" in the name of computer science.





Dr. Green is involved in creating a unique laboratory on the university campus that will facilitate research into computer graphics, image processing and database systems as well as the application of multimedia and visualization technology to other areas of science. The research is being funded with the assistance of a $433,000 major installation grant from NSERC.

The main components of the new lab are a "CAVE™," which is a high-performance graphics computer that can give researchers the 'big picture' – literally.

The CAVE™ will actually be a specially designed room where computer-generated images can be displayed on three walls. Stereo projection will be used to produce the images and viewers will have to be equipped with special stereo glasses to immerse them in the three-dimensional, computer-generated graphics.

Best of all, the CAVE™ won't just be of use to on-site researchers. Thanks to real-time video compression, it will be possible to transmit the CAVE™'s images to other locations within Canada.

"This facility will be unique within Canada and provide Canadian researchers with facilities matching the best in the world," says Dr. Green. "We plan to make it available to other researchers on a cost recovery basis." The group will begin to accept applications for external projects once the official opening of the CAVE™ has taken place in mid-December. Information on applying for CAVE™ time can be found on the CAVE™ Web site at ***www.cs.ualberta.ca/~graphics/cave/vrcave.html***.

While visiting the Web site, check out the construction progress as University of Alberta researchers build one of the most advanced computer visualization labs in the country.

Virtual Labs for Real-Life Scientific Training

In the scientist's laboratory, where fragile instruments coexist with powerful generators, untrained experimentation can yield explosive results. So an environment in which students can benefit from the hands-on element of learning without risk to themselves or their expensive laboratory equipment seems almost utopian, but at a number of Canadian universities it is already a reality – a virtual one.

Researchers at the TeleLearning Network of Centres of Excellence (NCE) are developing virtual reality simulations of science labs that enable students to carry out a range of experiments by computer, thus enhancing their classroom learning.

Virtual labs are interactive three-dimensional scenes designed to resemble their tangible counterparts. Students use a mouse to select objects in the lab, move them around, and adjust parameters such as the intensity of an electrical current or the frequency of a laser. Just like their real equivalents, the virtual instruments respond to students' manipulations by providing correct data if the experiments have been carried out properly.

Dr. Michel Duguay is the leader of the Multimedia Interactive Learning Environment with Simulation (MILES) project at the TeleLearning•NCE, and a Professor of Electrical and Computer Engineering at the Université Laval. He explains that given the high cost of laboratory equipment, most universities cannot afford to set up multiple versions of the same experiment. For example, there is only one optical spectrum analyzer at the Université Laval; it cost approximately $75,000 and students have to sign up in advance to use it.

In the virtual world, however, lab maintenance becomes relatively easy and inexpensive. To turn inanimate computer screens into dynamic laboratory simulations, virtual labs use small computer applications known as Java applets. According to Dr. Duguay, because Java applets are available free on the Internet, virtual labs can cost "virtually nothing."

Further, because virtual labs are PC compatible, any number of students can simultaneously access them from home at the hour that suits them best. This benefits students who must also accommodate work or parenting, as well as those who simply do not have enough time to do their experiments properly in fixed-duration labs.

Dr. Duguay, whose research is funded in part by NSERC, is one of many professors now using virtual labs to complement their lectures.

> *"I project the applets on a screen and use them to explain how different laboratory phenomena work," he says. "The students really love that because it's in colour, it's interactive, and when they leave the classroom they have a web site address and they can access these little virtual labs themselves."*

In fact, about 20 teams of students in Dr. Duguay's courses have chosen to create their own Java applets as part of various class projects. One of these, entitled "Exploring Electric Fields," is so useful that its creators regularly gets requests from professors at the university who want to use it in their classes – to which they readily agree.

But one of the most notable advantages of virtual labs is that they accommodate learning by trial and error, thus enhancing the traditional text and multimedia presentations of course material.

Aircraft pilots make ample use of this feature when they train in flight simulators. Similarly, students who train in virtual labs develop a more complete understanding of laboratory phenomena and show greater dexterity in the real labs.

Skeptics may contend that such advanced tools could eventually eliminate the need for teachers, but people more familiar with the technology's pros and cons disagree. "The more sophisticated the instruments, the more coaching you need to learn how to use them properly," says Dr. Duguay. "The virtual labs work best when they are used in conjunction with traditional teaching methods as another way for people to interact, learn together and create new things."

In fact, by welcoming collaboration, virtual labs encourage students to develop many of the skills of value to prospective employers.

As one of 14 federal Networks of Centres of Excellence, the TeleLearning•NCE links some 20 public and private sector member organizations with over 130 researchers and 175 students in education, social sciences, computer science and engineering at 30 universities across Canada. In 1998-99, the NCE funds going to the TeleLearning•NCE represent an investment of $3.7 million in Canadian research and development. The NCE program is administered by the three granting Councils (NSERC, MRC and SSHRC) and Industry Canada.

For more information, visit the NCE Web site at ***www.nce.gc.ca*** or the TeleLearning•NCE Web site at ***www.telelearn.ca***.

Editor's note: This is an abridged version of an article written by Jasmine Solomonescu, a Carleton University journalism student hired for the summer months by the NCE Program Directorate.

Students Take to Web-Based Forms

Our Web-based version of the *Application for an NSERC Scholarship or Fellowship* (Form 200) was available for the first time this fall, and many students decided to try it out. In fact, 3,865 students were curious enough to access the new process, while 1,717 of them used it to complete their application.

And it's just the beginning! NSERC staff are developing a similar process for its other forms. You'll no longer need to purchase specialized software, since everything is downloadable free of charge from the Internet.

Consult our Web site (***www.nserc.ca/forms1.htm***) frequently to see what's new in this area.

Research Partnership Agreements: 1998 Competition Results

NSERC and several other government agencies will be jointly funding research under Research Partnership Agreements. Here are a few of the projects that will be funded this year.

Canadian Forest Service

Studying the Impact of the Ice Storm
In partnership with the Ontario Woodlot Association, Professor Lenore Fahrig of the Department of Biology at Carleton University will document, over the next three years, the impact of the 1998 ice storm on forest vegetation, and its recovery over the medium term from this storm in Eastern Ontario. Dr. Fahrig's laboratory had serendipitously collected baseline data prior to the storm; now this established database will be a major asset to the newly funded research project.

Agriculture and Agri-Food Canada

Tackling a New Disease Affecting the Swine Industry
Professor Lorne Babiuk of the University of Saskatchewan's Veterinary Infectious Diseases Organization will be leading a three-year project to study the pathogenesis and characterization of the Post Weaning Multisystemic Wasting Syndrome (PMWS) agent. This newly identified disease affects young piglets. Characteristic signs of the condition are poor growth, emaciation, diarrhea and eventual death at 8-12 weeks of age. Dr. Babiuk's team, which includes his colleague Dr. Li Wang and industrial partner Boehringer Ingelheim, aim to develop better diagnostic tools to identify this agent as well as a vaccine to reduce the severity of the disease.

National Research Council of Canada

Improving the structural performance of floor systems
Professor Ying H. Chui of the Faculty of Forestry and Environmental Management at the University of New Brunswick will undertake research to improve the structural performance of wood/concrete floor systems. These systems, which consist of engineered wood joists, a wood-based sheathing and a plain concrete topping, were developed in response to enhanced performance requirements for acoustic insulation and fire safety. Dr. Chui will work with Forintek Canada Corporation and the National Research Council's Institute for Research in Construction.

New Initiatives Open to Researchers

The Canadian Forest Service, NSERC and SSHRC will jointly provide funding to help university-based researchers do leading-edge forestry research in the social sciences, humanities, natural sciences and engineering. Information on how to apply for these awards will be posted on NSERC's Web site (*www.nserc.ca/news1.htm*) in December. Proposals will be accepted starting in January; new awards will begin in April. The initiative will benefit from $500,000 from NSERC annually and should generate $1,600,000 from the other partners. One of the partners must be a Canadian company providing at least a third of the funding.

Natural Resources Canada's Earth Sciences Sector and NSERC have also agreed to support excellent collaborative research projects in the earth sciences. Each agency will provide up to $500,000 annually for awards, with a similar amount to come from industry. Information on how to apply will be posted on NSERC's Web site in January.

Research Partnership Agreements 1998 Competition Results

Research Partners[1]	No. of Requests	No. of Awards	Total Amount Requested[2] (year 1)	Total Amount Awarded[2] (year 1)
Agriculture and Agri-Food Canada	18	8	$1,589,035	$601,753[3]
Canadian Forest Service	12	8	$564,603	$419,983[4]
National Research Council of Canada	7	6	$1,001,306	$932,906[4]

[1] The DND/NSERC Steering Committee did not approve the one application for funding in the 1998 competition.
[2] Includes partner contribution.
[3] Includes six conditional awards.
[4] Includes one conditional award.

Deadline Removed for RPA Proposals

Beginning in January, all RPA proposals will be reviewed as they arrive. The April 15 deadline will be discontinued. This will be easier for private sector participants. NSERC will begin accepting RPA applications in January, with funding to start April 1.

University - Industry Synergy

Synergy Awards Showcase Successful Partnerships

Seven research partnerships were honoured before a distinguished audience in Halifax on November 4.

Launched by NSERC and The Conference Board of Canada four years ago, the Synergy Awards for University-Industry R&D Partnerships recognize the achievements of companies and academics who've joined forces to innovate and develop new products and services.

NSERC President Tom Brzustowski told the invited guests that they were there to celebrate "the accomplishments of people in universities and in industry working in partnership. University-Industry partnerships bring researchers who create new knowledge into close contact with those who use new knowledge productively in the economy. When these partnerships succeed, as these have done particularly well, they contribute to Canada's prosperity and they create great opportunities for the research students involved."

Winners of one of the two Category C awards. Seated, from left, Claudine Simson, Vice President, Global External Research and Intellectual Property, Nortel Networks; and Mildred Shaw, Industrial Research Chair in Software Engineering, University of Calgary. Standing, from left, John ApSimon, Vice-President, Research and External, Carleton University; (Tom Brzustowski, President of NSERC, and James R. Nininger, President and Chief Executive Officer, The Conference Board of Canada); and Peter Munsche, Assistant Vice-President, Technology Transfer, University of Toronto.

James R. Nininger, President and Chief Executive Officer of the Conference Board, spoke of the need to develop and support a more innovation-oriented culture. He added, "We feel that university-industry collaboration is a critical part of the innovation culture. It is an important tool for enhancing our innovative capacity and productivity."

The following winning partnerships demonstrate what a shared vision and purpose can accomplish for the social and economic well-being of Canada. Each award included a $10,000 grant for the university partners and a sculpture for the industry partners.

Category A-1 ***Small- and medium-sized companies***

- **Université Laval and Les matériaux de pointe Précitech inc.**
  for advancing the design and manufacturing process for powder metals.
- **the University of Waterloo and Certicom Corporation**
  for the development of the elliptic curve cryptosystem.

Category A-2 ***Large companies***

- **the University of Windsor and Chrysler Canada Ltd.**
  for the creation in 1996 of the Automotive Research and Development Centre.
- **the University of New Brunswick and Fraser Papers Inc.**
  for their research on forest management practices and the maintenance of critical wildlife habitat and biodiversity.

Category B ***Ventures involving at least two or more industry partners***

- **the University of British Columbia Pulp and Paper Centre, and OpTest Equipment Inc. and the Pulp and Paper Research Institute of Canada (Paprican)**
  for the development and commercialization of the FQA – Fibre Quality Analyzer, a revolutionary pulp and paper tool that measures pulp quality.

Category C ***Innovative and long-standing U-I interaction***

- **PRECARN Associates and IRIS**
  for their approach to developing industry-university interactions and promoting high quality collaborative research in intelligent systems and robotics.
- **Nortel Networks with Carleton University, the University of Toronto, and the University of Calgary**
  for their model for successful university-industry collaboration that focuses on research, resourcing and education programs.

To find out more about the 1998 winning partnerships, visit our Web site: ***www.nserc.ca/publicat.htm***. You'll find the brochure *1998 Synergy Awards for R&D Partnerships* under "Reports."

A Reminder to Say Thanks

As 1998 draws to a close, it's important to take a moment to look back on the events of the past year and give some thought to those who have helped us. If you have been meaning to formally acknowledge an act of kindness that was particularly helpful to your NSERC research but neglected to do so, now is the time! And we'll be glad to help.

Following up on a suggestion from Dr. Chris Smart of the Geography Department at the University of Western Ontario, NSERC created the "Friend of NSERC" certificate in spring 1990 as a means of formally thanking members of the general public who have helped researchers to carry out their NSERC-funded research.

If your research involves field work, for example, you're well aware how helpful private citizens can be. Often their local knowledge and logistic assistance not only helps to keep research costs down but also helps make the research more productive.

Although the awards are usually given to individuals, we've sometimes given them to organizations whose staff have gone that "extra mile." For instance, two researchers recently recommended Manitoba Hydro for the award. In addition to donating a $250,000 piece of equipment, Manitoba Hydro also paid for all transportation costs to move the equipment from its previous location in Burlington, Ontario, and the costs associated with modifying an existing cold room and laboratory to accommodate this apparatus. According to both researchers, however, the firm's research support involves much more than just funding. "Their expertise, logistic support, and attitude to R&D have been an essential component in all of our collaborative efforts," wrote one. Just as important as financial aid, wrote the other researcher, "is involvement of other forward-thinking engineering staff who involve themselves as 'liaison persons' for specific projects. They provide invaluable expertise, information and facilities for testing research ideas in the field."

If you are funded by NSERC in any capacity, you may nominate private citizens who have provided assistance, or material or logistic support (note: the intent is not to recognize personal acts of kindness and courtesy – that is left to the individual who experienced them.)

Just send us a note including details of the individual(s) who helped you as well as their name and mailing address, and we'll send them a "Friend of NSERC" certificate thanking them on your behalf and NSERC's for their help. Address nominations to: Friends of NSERC, Communications Division, NSERC, Ottawa, Ontario K1A 1H5, Fax: (613) 943-0742, E-mail: ***comm@nserc.ca.***

During the NSERC 20th anniversary dinner hosted by the University of Manitoba, a "Friend of NSERC" certificate was presented to Manitoba Hydro in recognition of its role in advancing research in the province. Shown, left to right, are: Jay Doering, civil and geological engineering, U of M; Al Snyder, vice-president, Manitoba Hydro; Paul Soubry, chair, U of M Board of Governors; Tom Brzustowski, president, NSERC; Joanne Keselman, vice-president (research), U of M; and Roger Ludwick, research and development planning officer, Manitoba Hydro.

Now, more than ever before, when R&D is in need of public support, it is particularly important for researchers to take the time to communicate with the public and in doing so, help to build support for research sponsored by NSERC.

New Modus Operandi

In response to requests by users who found it difficult to guess the e-mail addresses of Council staff, NSERC has implemented a better system.

The new format – ***firstname.lastname@nserc.ca*** – will be familiar to many of you because it's used elsewhere.

Our e-mail addresses can be entered either in uppercase or lowercase characters, or any combination of the two. Some users' names have had to be adjusted because current Internet standards do not support the use of accents, spaces, and other special characters in e-mail addresses. Hyphens are acceptable though.

Our old e-mail addresses (xxx@nserc.ca) will remain in use for the foreseeable future. So there's no need to worry if you've just sent an e-mail to someone at NSERC using the old address. It won't end up in cyberspace!